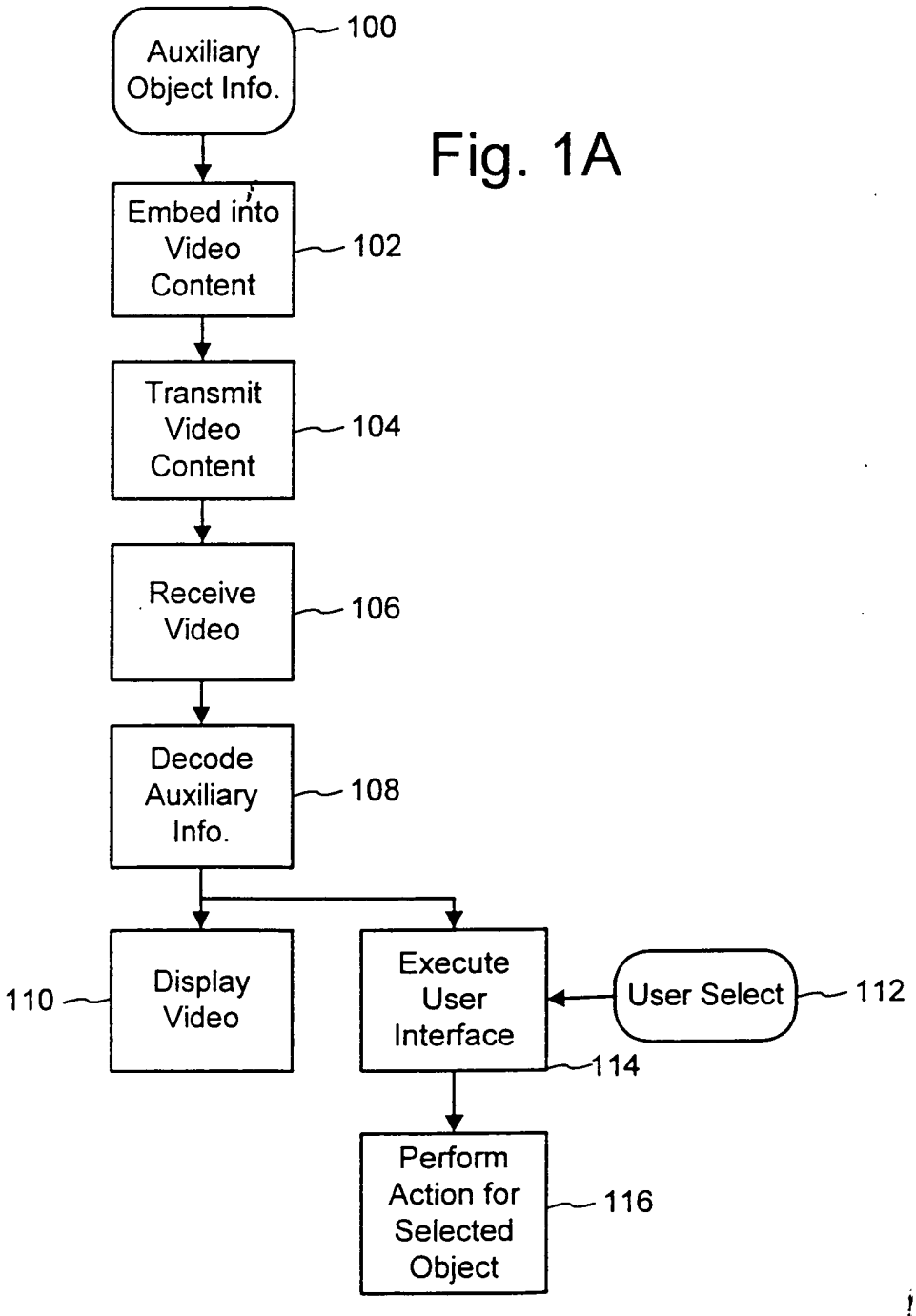

Auxiliary Object Info.
100
Embed into Video Content
102
Transmit Video Content
104
Receive Video
106
Decode Auxiliary Info.
108
Display Video
110
Execute User Interface
User Select
112
114
Perform Action for Selected Object
116

Fig. 1A

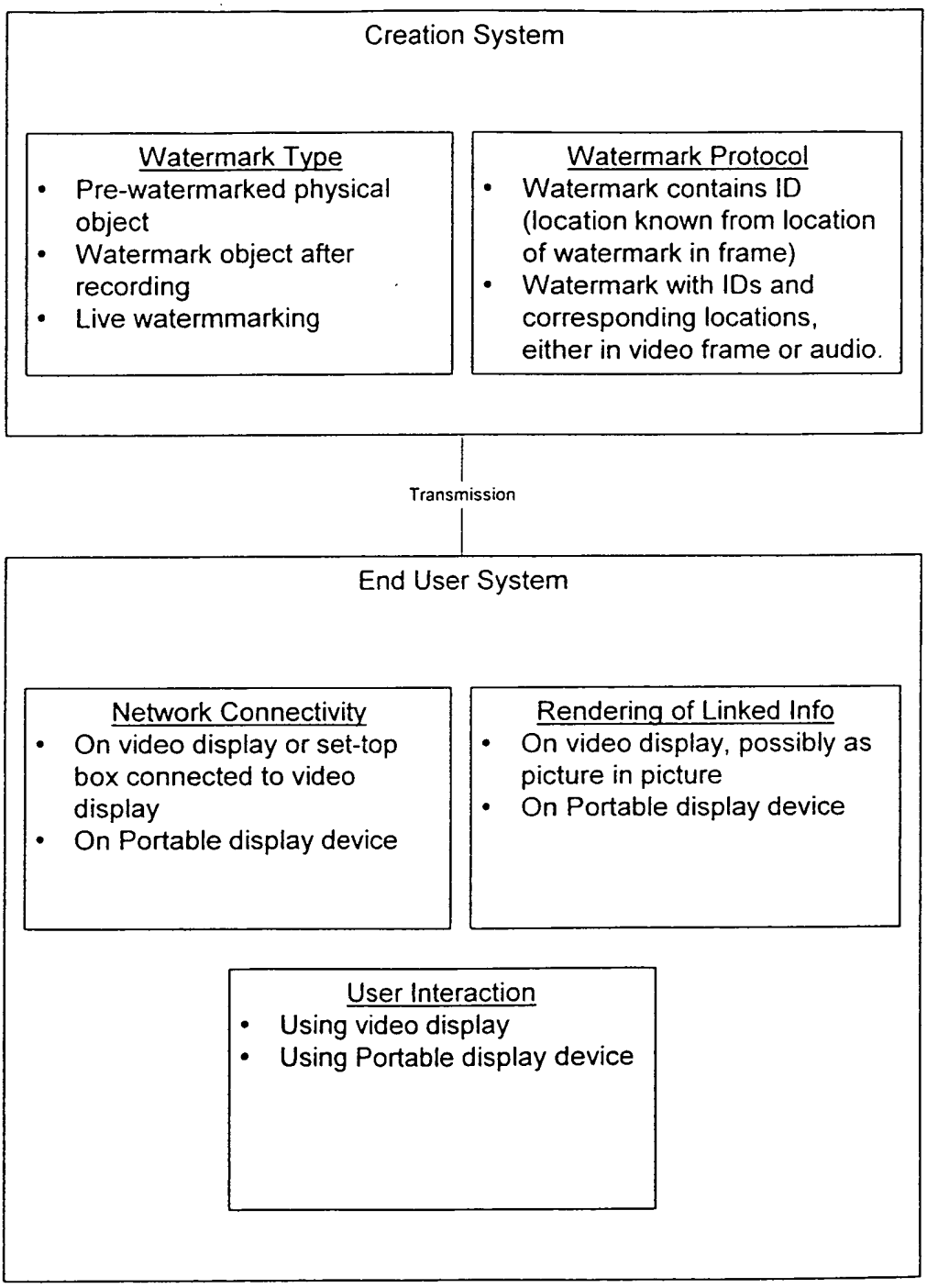

Creation System
Watermark Type
• Pre-watermarked physical object
• Watermark object after recording
• Live watermmarking
Watermark Protocol
• Watermark contains ID (location known from location of watermark in frame)
• Watermark with IDs and corresponding locations, either in video frame or audio.
Transmission
End User System
Network Connectivity
• On video display or set-top box connected to video display
• On Portable display device
Rendering of Linked Info
• On video display, possibly as picture in picture
• On Portable display device
User Interaction
• Using video display
• Using Portable display device

Fig. 1B

Fig. 2

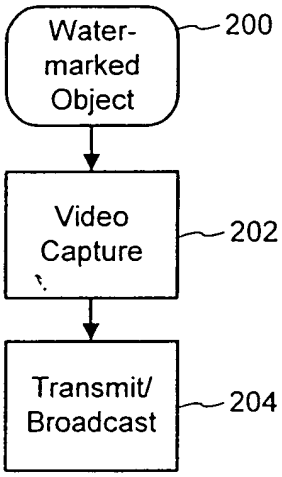
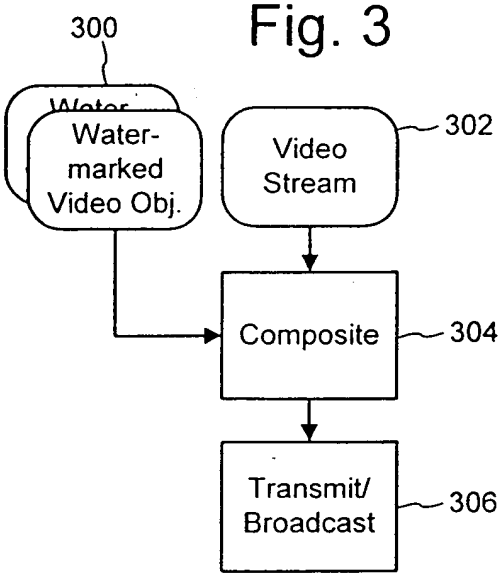


Fig. 3



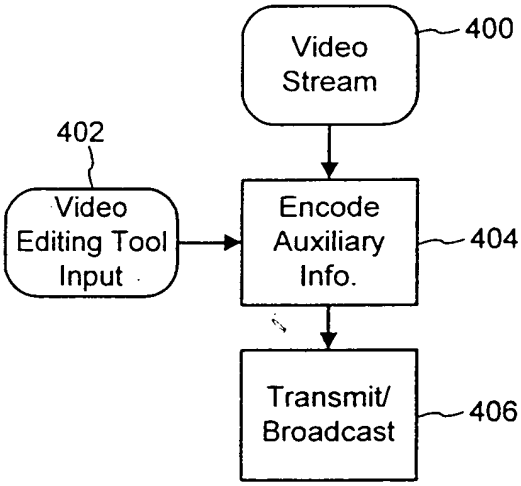


Fig. 4

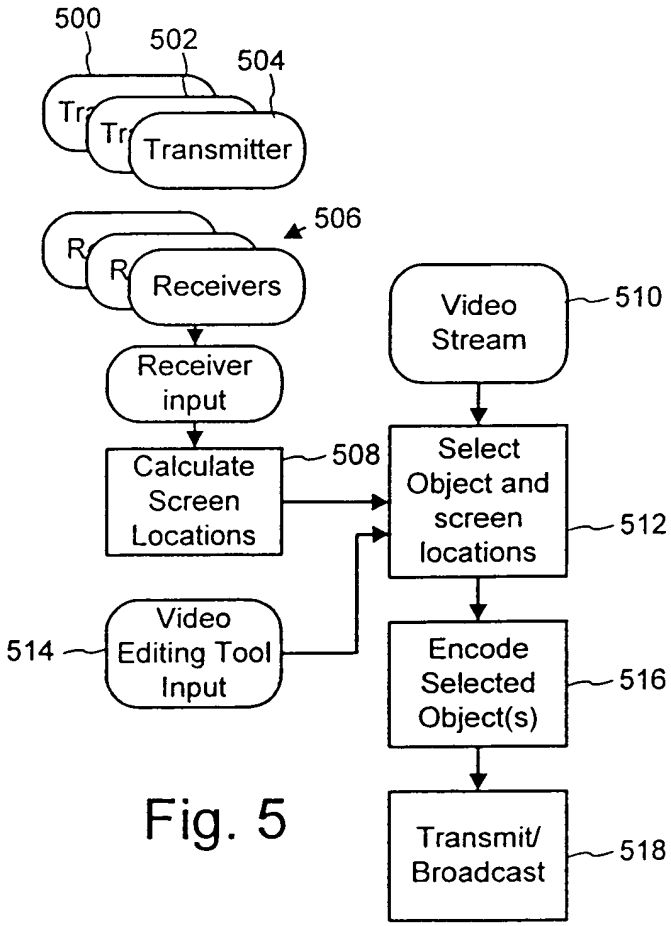


Fig. 5

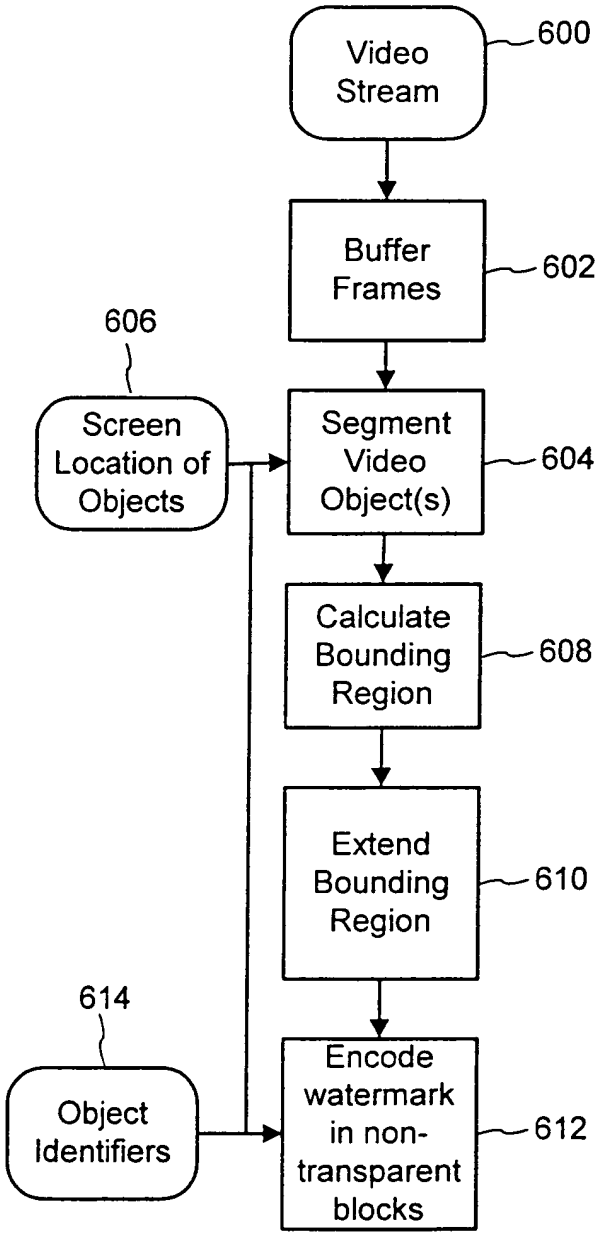
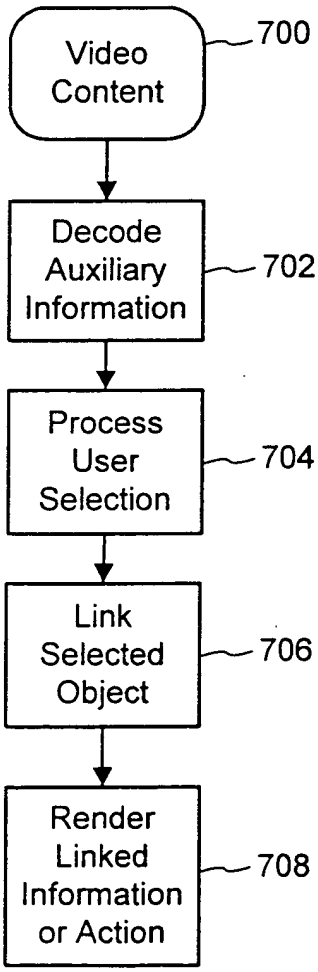

Video Stream
600
Buffer Frames
602
606
Screen Location of Objects
Segment Video Object(s)
604
Calculate Bounding Region
608
Extend Bounding Region
610
614
Object Identifiers
Encode watermark in non-transparent blocks
612

Fig. 6

Fig. 7


Video Content
700
Decode Auxiliary Information
702
Process User Selection
704
Link Selected Object
706
Render Linked Information or Action
708

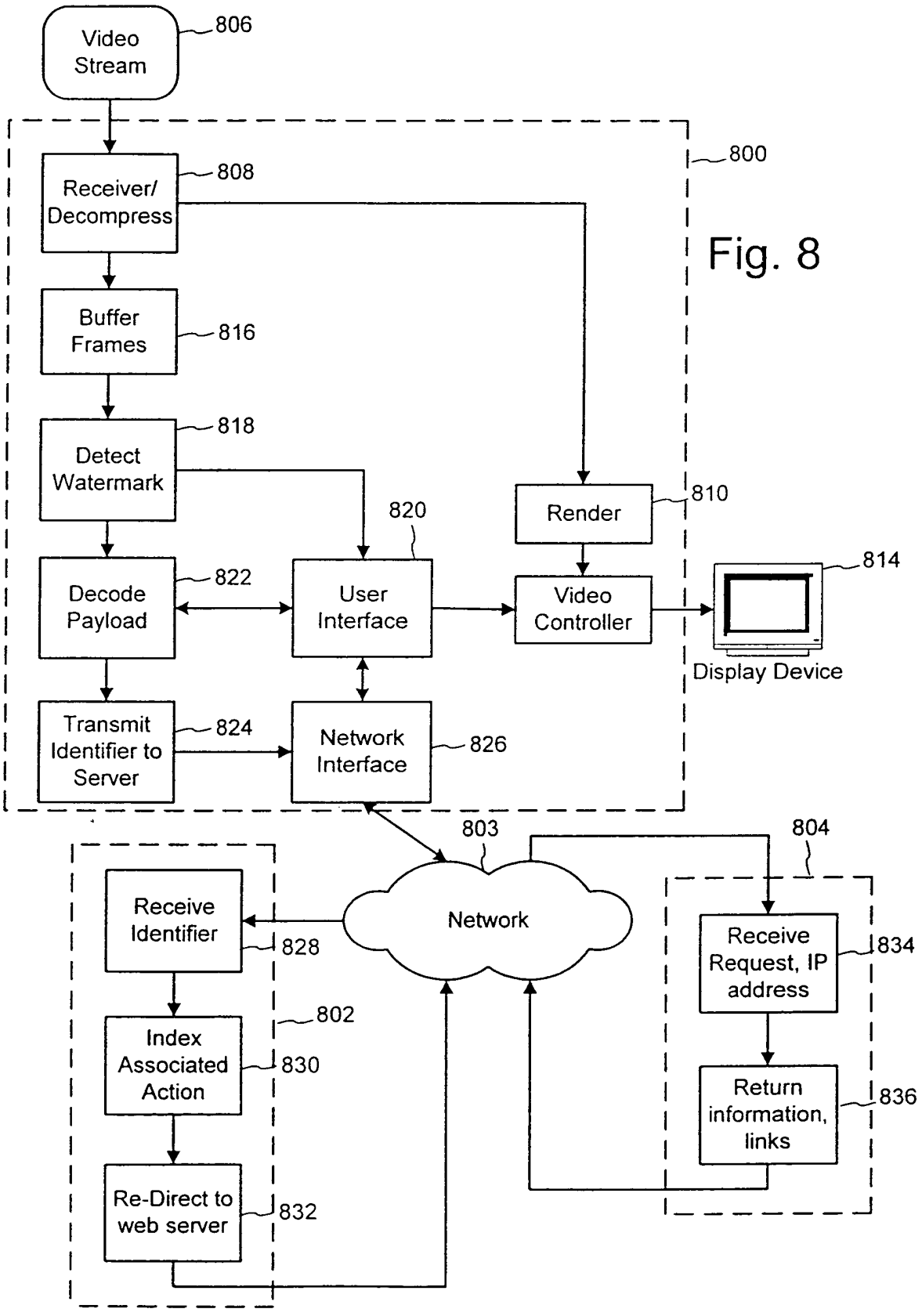
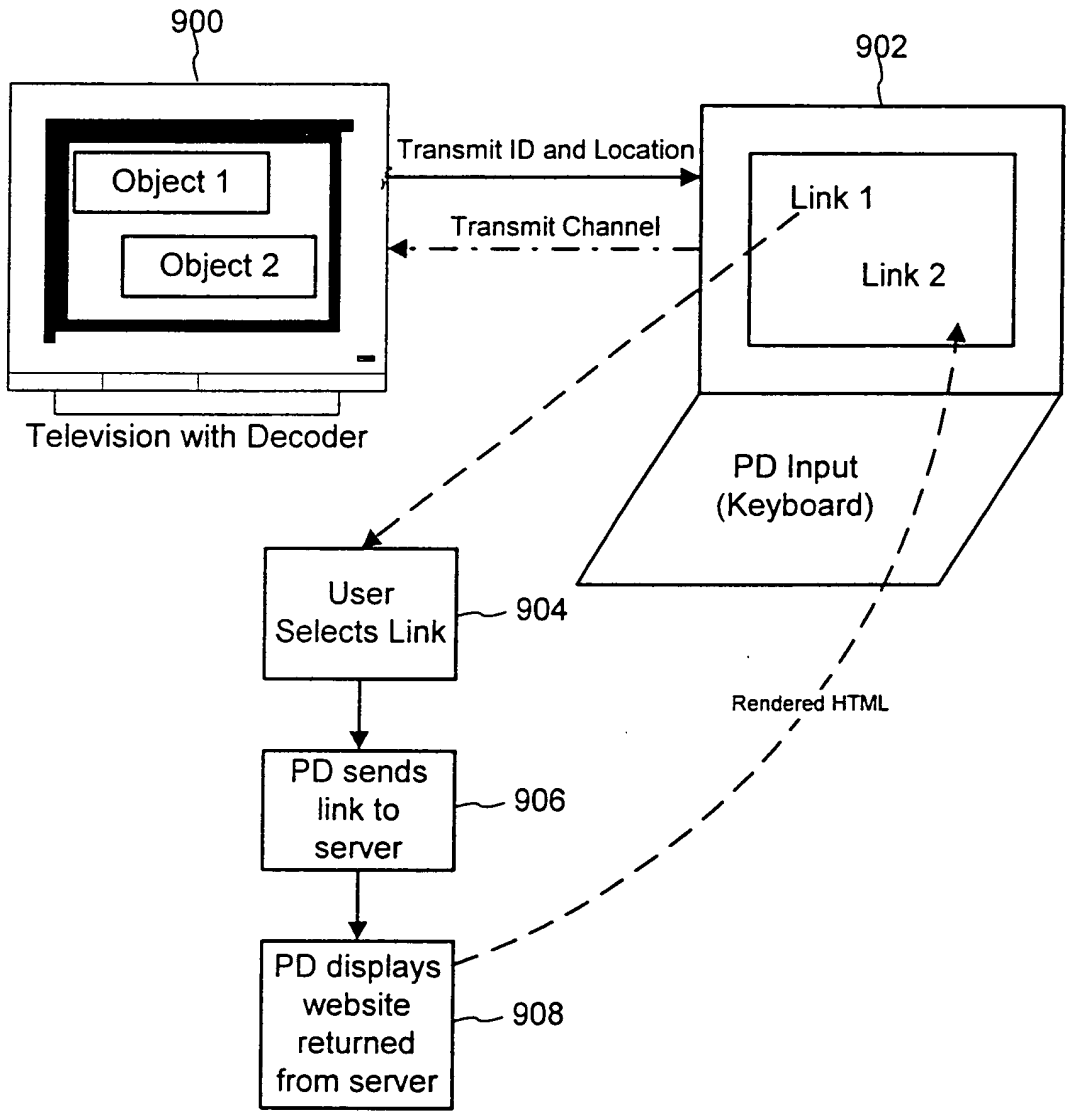

Video Stream
806
800
Receiver/ Decompress
808
Buffer Frames
816
Detect Watermark
818
820
Render
810
Decode Payload
822
User Interface
Video Controller
814
Display Device
Transmit Identifier to Server
824
Network Interface
826
803
804
Receive Identifier
828
Network
Receive Request, IP address
834
802
Index Associated Action
830
Return information, links
836
Re-Direct to web server
832

Fig. 8

Fig. 9


900
902
Object 1
Object 2
Transmit ID and Location
Transmit Channel
Link 1
Link 2
Television with Decoder
PD Input
(Keyboard)
User
Selects Link
904
Rendered HTML
PD sends
link to
server
906
PD displays
website
returned
from server
908